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(54) DISPLAY ELECTRODE FOR PLASMA DISPLAY AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a display electrode directly manufactured on a back substrate for plasma display and its manufacturing method.

SOLUTION: In a display electrode for plasma display made by providing a display electrode layer on a back substrate, physical development centers are provided on the back surface and the display electrode layer is a silver film obtained by dissolving silver halide and by receiving an image by the physical development centers at the time of development. This display electrode for plasma display is manufactured by forming a photosensitive layer containing silver halide emulsion on the back substrate having the physical development centers, developing silver halide in a photosensitive layer in portions irradiated with light while dissolving silver halide in portions not irradiated with light, and when developing, forming a silver film by receiving an image by the physical development center portions and removing the photosensitive layer.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the display electrode for plasma displays, and its manufacture approach.

[0002]

[Description of the Prior Art] The display electrode layer of the tooth-back substrate for the conventional plasma displays printed silver solder by the silk screen printing method on the tooth-back substrate, could be burned and was producing this. However, the limitation of line breadth was about 100 micrometers, and print processes were not enough as the repeatability of the thin line beyond this. Moreover, cost starts production of a version and the proposal of the production approach of a new display electrode, such as producing a direct presentation electrode -- the problem of alignment occurs -- while manufacture precision moreover improves, is needed.

[0003]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is to offer a display electrode producible on the tooth-back substrate for direct plasma displays with high thin line repeatability, and its approach.

[0004]

[Means for Solving the Problem] this invention persons have a physical development nucleus on this tooth-back substrate in the display electrode for plasma displays which comes to prepare a display electrode layer on a tooth-back substrate, as a result of inquiring, and the above-mentioned problem was solved with the display electrode for plasma displays with which this display electrode layer is characterized by being the silver film which a silver halide is dissolved and is obtained by receiving a picture by this physical development nucleus at the time of development. Moreover, while forming the sensitization layer containing a silver halide emulsion on the tooth-back substrate which has a physical development nucleus and developing the silver halide of the optical exposure section in the sensitization layer, the silver halide for a non-irradiated area was dissolved, a picture was received in this physical development nucleus part at the time of development, the silver film was formed, and the above-mentioned problem was solved by the manufacture approach of the display electrode for plasma displays characterized by to remove a sensitization layer. Furthermore, in the display electrode for plasma displays which comes to prepare a display electrode layer on a tooth-back substrate, the silver halide was dissolved, and this display electrode layer is the silver film obtained by receiving a picture by the physical development nucleus at the time of development, and solved the above-mentioned problem with the display electrode for plasma displays characterized by holding this physical development nucleus on a tooth-back substrate with the metallic oxide.

[0005]

[Embodiment of the Invention] This invention is explained below at a detail. This invention makes a silver film form on a tooth-back base material first by the principle of silver complex salt diffusion transfer process (the DTR method is called henceforth). An unexposed silver halide dissolves and it is

changed into a fusibility silver complex compound, and this diffuses the inside of a silver halide emulsion layer, is developed in a physical development nucleus's existence location, and forms a silver film as indicated as the DTR method by a U.S. Pat. No. 2352014 specification or "Photographic Silver Halide Diffusion Processes", Andre Rott, Edith Weyde work, and The Focal Press (1972). On the other hand, the latent-image nucleus forms the silver halide of the exposure section by optical exposure, and a silver halide is developed in this emulsion layer by the latent-image nucleus.

[0006] Next, if hot water etc. removes a silver halide emulsion layer, only the silver film formed on the physical development nucleus by the unexposed part will remain on a tooth-back base material, and will form an image. This silver film has conductivity and can use it as a display electrode layer for plasma displays. Thus, the silver film produced is exposed in a suitable exposure region, if negatives are developed appropriately, the repeatability of an about 10-20-micrometer thin line will also become possible, and compared with the conventional print processes, it is markedly alike, and the precision improves.

[0007] Although the display electrode layer by the silver film can be formed in an unexposed part by the above-mentioned approach, if the latent-image nucleus forms into the silver halide beforehand and the electronic receptiveness matter uses together around a silver halide, generally the formation approach of the display electrode layer which serves as a reversal mold to exposure which make carry out oxidation disappearance of the latent-image nucleus only in the exposure section, and can form the display electrode layer by the silver film on a tooth-back substrate is also possible.

[0008] As a tooth-back substrate, although low thermal expansion glass, such as soda lime glass, such as soda lime and White crown, a HOUKEI acid, non-alkali, and aluminosilicate, synthetic quartz glass, polyester film, etc. can be used, if thermal resistance and ultraviolet resistance are taken into consideration, the transparency base material using inorganic glass is suitable.

[0009] With a physical development nucleus, there are sulfides, such as the sulfide of heavy metal, for example, antimony, a bismuth, cadmium, cobalt, lead, nickel, palladium, platinum, gold, silver, and zinc. furthermore, salts, such as SERENAIDO, poly SERENAIDO, polysulfide, a mercaptan, and halogenation tin (II), and heavy metal -- they are silver, gold, platinum, palladium, mercury, etc. preferably. It is the sulfuration palladium nucleus which has an average diameter of less than 6nm which is indicated by the Europe public presentation patent No. 546598 official report as a still more desirable physical development nucleus used by this invention.

[0010] With the silver halide used for this invention, a silver chloride, a silver bromide, a silver iodide, etc. can be used. Although these make complex ion and halogen ion react and are compounded in gelatin, the halogen silver of the various crystal structures, such as plate-like and a core shell mold, can be used. Generally, although the particle diameter of a silver halide is said to high sensitivity that it becomes low sensibility so that it becomes small so that a path becomes large, it is used in 0.05 to 1.00 micrometers.

[0011] Moreover, iridium, a rhodium content compound, etc. can be added to the reaction time of complex ion and halogen ion, and the surface state of a silver halide particle can also be controlled. Ten - three mols of these addition compounds are about ten - six [10-seven to] mols preferably from 10-8 about one mol of silver. Furthermore, a chemical sensitizer, spectral sensitization coloring matter, an antistatic agent, etc. can be added.

[0012] Although reaction synthesis of the silver halide is carried out in gelatin, since the ionicity impurity in gelatin tends to affect the photograph property of a silver halide, it is necessary to fully remove it. Moreover, an emulsion stabilizer is also mixable in order to give the distributed stability in the gelatin water solution of a silver halide at the time of composition. As a desirable stabilizer, there are aza-indenes, a heterocycle type mercapto compound, etc. In this invention, the layer formed on the silver halide emulsion, the call, and the tooth-back substrate in the ingredient containing these silver halides, gelatin, an addition compound, a distributed stabilizer, etc. is called a sensitization layer. A sensitization layer is in the condition which contains a silver halide about 90% from 10 of the weight, and is preferably held [2] about 15 micrometers about 20 micrometers from 0.5.

[0013] In order to dissolve a silver halide, alkanolamine, a thioether, the mesoionic compound

represented by the triazolium thio rate, a sulfite, a thiosulfate, an amine, 2-mercaptopbenzoic acid, a ring type imide compound, an alkyl sulfone, etc. can be used. Moreover, even if 4 and 6-dihydroxy pyrimidine, other silver halide solvents, etc. combine two or more sorts, they can be used. In addition to a development solution, these are used.

[0014] As a developer, there is p-dihydroxybenzene systems, for example, sodium, such as hydroquinone, methyl hydro KINON, and KURORU hydroquinone, a potassium or ammonium thio sulfate, sodium, a potassium, or ammonium thio cinae flos NETO, for example. In addition to a developer, these are used.

[0015] The metallic oxide for holding the physical development nucleus in this invention shows metallic oxides or these hydroxides, such as colloidal silica, a colloidal alumina, titanium oxide, a zinc oxide, and a zirconium dioxide. Maintenance shows that a physical development nucleus is shown in a metal oxide layer front face, or it is in either of the metal oxide layers. Colloidal silica is the colloid object of an amorphous silicic acid anhydride, a front face is embellished with the ion and compounds other than no denaturalizing, such as ammonia, calcium, and an alumina, for a silica front face, and the denaturation colloidal silica which changed the behavior to the ionicity of a particle or pH fluctuation is also included. A colloidal alumina is a colloid object which has distributed configurations, such as the shape of a non-fixed form or feathers of pseudo-**-dynamite (boehmite of wide sense is included)-like hydrated alumina, fibrous, or tabular.

[0016] Furthermore, synthetic inorganic polymers, such as fluorine micas, such as natural clay minerals, for example, fluorine phlogopite, such as kaolinite-serpentine groups, such as smectite groups, such as saponite, hectorite, and a montmorillonite, a vermiculite group, a kaolinite, and halloysite, and sepiolite, a fluorine 4 silicon mica, and a TENIO light, and a synthetic smectite, etc. can be used.

[0017] After distributing minutely in the solvent containing water and making it mix with a physical development nucleus, these metallic oxides or hydroxides are applied on a tooth-back substrate, and are held. As a particle size of the metallic oxide distributed minutely or a hydroxide, it is used by about 100 micrometers from 1nm. Furthermore, a metal oxide layer is also producible with an organometallic compound. A metallic oxide may be heated at 150 degrees C or more, in order to dry and to heighten the bonding strength between the particles of a metallic-oxide particle, after being applied on a tooth-back substrate. Moreover, if it heats at 600 degrees C or more, the combustion removal of the organic substance can be carried out, and also particle growth of a metallic oxide is caused and film reinforcement improves.

[0018] As an organometallic compound, a tetra-ethoxy silane, vinyltriethoxysilane, Gamma-chloropropyltrimetoxysilane, gamma-aminopropyl TORIETOI gardenia fruit run, N-(beta-aminoethyl)-gamma-aminopropyl methyl dimethoxysilane, gamma-mercapto propyltrimethoxysilane, gamma-glycidoxypropyltrimetoxysilane, gamma-glycidoxypropyl methyltrimethoxysilane, gamma-methacryloxypropyl trimethoxy silane, Gamma-methacryloxypropylmethyltrimethoxysilane, aluminum isopropoxide, Organometallic compounds, such as aluminium acetate, indium acetyl acetate, zinc acetyl acetate, zinc stearate, alt.titanic-acid tetraethyl, alt.titanic-acid tetra-isopropyl, alt.titaniumbutylate, and barium oxalate, can be used.

[0019] Moreover, depending on the case, these organometallic compounds and metal chlorides, such as for example, a dimethyl dichloro silane, a diphenyl dichloro silane, a dimethylphenyl KURORU silane, an aluminum chloride, and a titanium tetrachloride, are also combinable. These organometallic compounds serve as a metal oxide layer by sintering, raise the holdout of a tooth-back substrate and a physical development nucleus, and an adhesive property, and raise the adhesive property of the silver film finally generated.

[0020] The amount of the physical development nucleus held on a tooth-back substrate is the range of two or less two or more 0.4 mg/m² to 25 mg/m², and is the range of 1 mg/m² to 20 mg/m² preferably. Moreover, about 50 micrometers of metallic oxides are preferably used by 0.2 to about 10 micrometers from 0.1 micrometers. The physical development nucleus may be mixed in the metal oxide layer, and in this case, to the amount of a physical development nucleus, the amount of a metallic oxide is about 0.01 to 100000 weight ratio, and is preferably used by about one to 10000 weight ratio.

[0021]

[Example] Hereafter, although an example explains this invention to a detail further, unless the meaning of this invention is exceeded, it is not limited to these.

[0022] The palladium-chloride 1.77 weight section, the sodium-thiosulfate 3.16 weight section, and the sodium-sulfide 0.39 weight section were added for adjustment of example 1 physical-development nuclear sap and also the distilled water 2000 weight section in the 30-degree C condition, and the sulfuration palladium as a physical development nucleus was obtained. **** of the sulfuration palladium at this time was an average of 1.5nm.

[0023] The physical development nuclear sap produced at the production place of a physical development nuclear lamina was applied on the glass substrate by the spinner, and was heated at 80 degrees C for 30 minutes, and it dried.

[0024] Ultralow volume content of the production rhodium chloride of a sensitization layer and the iridium chloride was carried out, the chloride emulsion which consists of the silver chloride 70 weight section whose mean diameter is 0.2 micrometers, the photographic gelatin (product made from Nitta gelatin) 30 weight section, and distilled water 300 weight was produced, and this emulsion was heated at 40 degrees C, by the spinner, it applied on the physical development nuclear lamina, and quenched, and in 25 degrees C, it dried with cold blast for 12 hours, and the sensitization layer set to 4 micrometers after desiccation was produced. All of production of an emulsion, spreading, and a desiccation process were performed in the dark room.

[0025] The production carboxymethyl cellulose of a developer A 4.0 weight sections sodium hydroxide 22.5 weight sections dried sodium sulfite 120.0 weight sections hydroquinone A 20.0 weight sections potassium bromide 0.8 weight sections anhydrous sodium thiosulfate 8.0 weight sections distilled water The liquid of the 1000.0 weight section was produced and it considered as the developer.

[0026] Exposure and four fluorescent lamps of development 10W were put in order, it shaded in part, and light was irradiated for 30 seconds from the distance of 50cm on the sensitization layer. It was immersed in the 25-degree C developer for 30 seconds after that, and development by the DTR method was performed. Next, 35-degree C warm water removed the sensitization layer, and the display electrode layer by silver was obtained on the tooth-back substrate. The thickness of this silver film was 0.8 micrometers, and resistance was 3ohm/**. Moreover, the 30-micrometer thin line reappeared.

[0027] The production titanium oxide dispersion liquid of an example 2 physical-development layer were produced, it applied by the spinner, and heated at 600 degrees C for 60 minutes, and the metal oxide layer with a thickness of 3 micrometers was produced. Next, the physical development liquid produced in the example 1 was applied by the spinner on the glass substrate, it heated at 120 degrees C after that, and the physical development nuclear lamina was produced. On this layer, the 5-micrometer sensitization layer was produced like the example 1, exposure development was carried out, finally the sensitization layer was removed, and the display electrode layer was obtained. The thickness of a display electrode layer was 1.0 micrometers, and resistance was 2.5ohm/**. Moreover, the 25-micrometer thin line reappeared.

[0028]

[Effect of the Invention] According to this invention, the display electrode was able to be obtained on the tooth-back substrate for plasma displays by direct exposure simple as explained above.

[Translation done.]